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(54) Title: MEAL REPLACEMENT COMPOSITION (57) Abstract A dry nutritious food composition adapted for mixing with water to form an aqueous dispersion having a pleasing palatable taste with improved filling characteristics which is useful as a total meal replacement and which contains protein selected from the group consisting of casein, calcium caseinate, sodium caseinate and non-fat milk solids, lipids, carbohydrates and non-degradable vegetable fiber in the form of cellulose gum and cellulose gel and containing added vitamins, trace minerals and flavoring agents.		

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MEAL REPLACEMENT COMPOSITION

This invention relates generally to a dry food composition adapted for mixing with water to form a liquid composition useful as a total meal replacement and more particularly to a dry food composition readily dispersible in water to form a highly palatable, nutritious drink containing protein, lipids, carbohydrates, vitamins, minerals, non-degradable vegetable fiber and flavoring agents.

Various dry food compositions designed primarily for mixing with water have been developed heretofore. Some of these prior art dry food compositions which are adapted primarily for mixing with water have been designed to provide a very high protein diet with low residuals for use where the individual has a special dietary problem without providing a balanced diet (U. S. Patent No. 3,950,547) while other dry food compositions intended for dispersing in water have been designed to provide a proper balance of protein, vitamins, fat and carbohydrates (U. S. Patent No. 3,097,941) but fail to adequately satisfy an individual's feeling of hunger when the product is consumed as a total meal replacement and are not sufficiently palatable.

In order for any food composition used to control body weight to be of significant value and be acceptable as a total replacement for at least one meal each day over an extended period, it is essential that the composition have a pleasing taste and satisfy an individual's feeling of hunger when consumed and between meals. The dry, water dispersible food composition of the present invention



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is designed to provide the essential nutritional and health needs of an individual when used as a total meal replacement at least once each day for an extended period and contains a relatively 5 high concentration of protein, vitamins and minerals along with sufficient lipids, carbohydrates and vegetable fiber to enable forming when mixed with only water a highly palatable liquid composition which fully satisfies the individual's feeling 10 of hunger.

More particularly, the dry food composition of the present invention comprises a uniform mixture of ingredients which are readily dispersible in water and includes protein selected from the group 15 consisting of casein, lactic casein, calcium caseinate and sodium caseinate, essential vitamins and most recommended trace minerals, saturated and unsaturated lipids, carbohydrates largely in the form of fructose, and vegetable fiber material 20 which is not degradable when ingested together with selected natural and artificial flavoring agents.

The protein in the composition of the present invention is derived entirely from animal protein 25 and consists of casein, calcium caseinate, sodium caseinate and non-fat milk solids. Each serving unit of the dry composition when mixed with water is designed to provide at least one-third the minimum recommended daily requirement for protein and 30 preferably about 22 grams or about one-half the recommended minimum daily requirement (exclusive of any protein in a liquid dispersing medium). The protein content of the dry composition on a



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weight basis can range between about 25% to 50% but is preferably about 35%. The caseinates along with the casein serves to provide bulk to the liquid dispersion in addition to providing high quality protein which adds to the feeling of satisfaction when used as a total meal replacement.

The lipid content of the dry food composition can range between about 5% and 10% by wt. and is obtained largely from partially hydrogenated vegetable oils, such as soybean oil, corn oil or the like, with a small amount of added lecithin which also serves as a natural emulsifying agent. In one preferred embodiment the lipids preferably comprise about 8% by weight of the dry ingredients.

15 The vegetable oil is hydrogenated sufficiently to stabilize the oil against oxidation so as to avoid the need for artificial preservatives without fully saturating the oil.

The carbohydrates of the composition are provided by natural sweeteners (i.e. sugar), preferably fructose, although other natural sugars, such as dextrose or corn syrup solids, can be used.

20 The carbohydrate content of the dry composition in a preferable form comprises about 48% by wt. and is designed to provide in combination with the lipid content about 250 calories in each 62 gram unit serving of the aqueous dispersion. If desired, however, the carbohydrate can range between about 20% and about 50% on a dry wt. basis. The 25 lipid content when combined with the carbohydrates and between about 0.4 and 5.0 percent on a dry weight basis of a non-degradable vegetable fiber imparts to the composition the characteristic of



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satisfying the individuals feeling of hunger for a prolonged period when used as a total meal replacement.

The fiber content of the dry food composition is an important ingredient of the present composition and contributes significantly to imparting bulk to the aqueous dispersion. The vegetable fiber ingredient used is selected from the class of cellulose gum and cellulose gel materials known as microcrystalline cellulose and has the characteristic of not being degraded when ingested in the stomach of a human being. When very finely ground the microcrystalline cellulose can be used in an amount up to about 5% by wt. of the dry composition. The microcrystalline cellulose when comprising about 0.5 to 1.0 percent by wt. of the composition is equivalent to about 10% by wt. of ordinary wheat bran, since the latter is partially digested in the intestinal tract of a human being. The microcrystalline cellulose can be obtained by the treatment of wood fiber, such as sulfite wood pulp, in the manner described in U. S. Patent No. 3,023,104 and is suitable for use in the present composition.

Use of a non-degradable vegetable fiber material in a water dispersible food composition makes it possible to dispense with a significant amount of the filler material and lipids normally required in order to provide the composition with the required hunger satiating characteristic. And, as a result of using a non-degradable vegetable fiber material in the water dispersible composition it is possible to include in the present composition a sufficient amount of ingredients which impart



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to the composition when mixed only with water a pleasingly palatable taste, and the resulting liquid composition is much more palatable than the prior art compositions designed to be dispersed only 5 in water.

Vitamin and mineral additives are used in the composition to provide each serving unit with a large proportion of the essential vitamins and minerals. For example, each serving unit of the 10 composition is preferably designed to supply about 45% of the minimum daily requirements of vitamins and about 45% of most of the trace minerals.

The following examples illustrate the preparation of the dry food composition of the present 15 invention and describes the manner of using the composition.

Example 1

The ingredients for a dry food composition and the proportions used on a part by weight basis 20 are as follows:

	<u>Ingredients</u>	Serving Unit 62 grams 250 calories
	Calcium caseinate	23.0
	Sodium caseinate	5.9
25	Casein	10.68
	Lecithin	.15
	Partially hydrogenated soy bean oil	3.4
	Natural and Artificial Vanilla Flavor	0.9
30	Orange Flavor	0.3
	Instant fat-free dis- persible milk solids	25.4



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	Fructose	25.4
	Corn Syrup Solids	4.5
	Calcium Pyrophosphate	1.9
	Magnesium Oxide	0.2
5	Vitamin Assay Core	0.49
	Vegetable fiber, non-degradable (very fine grind)	0.4

In preparing the dry food mixture the fructose is added to a ribbon mixer and while the mixer is operating the casein is added and thoroughly mixed with the fructose. While the mixer is running the following ingredients are added to the mixer in the order mentioned and blended for about 5 minutes:

15 Lecithin

Artificial vanilla flavor and

Partially hydrogenated soy bean oil

The following ingredients are then added to the mixer while the mixer is stopped and thereafter blended 20 for 5 minutes:

Calcium caseinate and sodium caseinate

~~Natural and synthetic vanilla flavors~~

Dispersing agent

Corn syrup solids

25 Calcium pyrophosphate

Magnesium oxide

Vitamin assay core

Vegetable fiber

The instantized fat-free milk solids ingredient is 30 mixed for an additional 5 minutes. The mixture is then screened and packaged in a water impervious envelope, each containing 62 grams net weight.



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It will be understood that while the composition described in the foregoing specific example has a vanilla flavor, other flavoring agents and flavor ingredients can be used in place of those indicated.

5 Each serving unit of the dry composition of the foregoing specific example (62 grams) supplies about 22 grams protein, about 30 grams carbohydrates and about 5 grams of lipids.

Example 2

10 The following ingredients are used to prepare a dry nutritious food composition:

	<u>Ingredients</u>	<u>Serving Unit</u>
		<u>62 grams</u>
		<u>250 calories</u>
15	Calcium caseinate and sodium caseinate - 75:25 (Savertone 460, Western Dairy Products, San Francisco, California)	23.6
	Casein	10.68
	Lecithin	.15
20	Partially hydrogenated soy bean oil (Durkex, Durkee Industrial Foods, Cleveland, Ohio)	2.84
	French vanilla Polak's Frutal Works, Middletown, N. Y.)	.69
25	Butter (Felton #428, Felton Industries, Brookland, New York)	.037
	Vanilla flavor, Felton Industries, Brookland, New York)	.12
	Instant fat-free dispersible milk solids	25.4
30	Fructose	25.4



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	Coffee Whitener (calcium caseinate, corn syrup solids, and partially hydrogenated vegetable oil - Beatrice Foods, Chicago, Ill.)	10.61
5	Calcium pyrophosphate	1.9
	Magnesium oxide	0.2
	Vitamin assay core	0.49
	Vegetable fiber, very fine grind (Avicel-Ph 101).	0.4
10	The ingredients are mixed as in Example 1, screened and packaged in a water proof envelope to provide serving units of 62 grams. Each serving unit provides 250 calories, 22 grams of protein, 30 grams carbohydrates and 5 grams of lipids.	

Example 3

15 The following ingredients are used to prepare a dry food composition:

	<u>Ingredients</u>	<u>Service unit</u> 48 grams <u>180 calories</u>
20	Calcium caseinate	23.4
	Sodium caseinate	7.3
	Casein	12.03
	Lecithin	.185
25	Partially hydrogenated soy bean oil	.285
	Natural and artificial vanilla flavor	1.0
	Fat-free dispersible milk solids	32.93
30	Fructose	20.99
	Corn syrup solids	1.2
	Calcium pyrophosphate	2.4



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Magnesium oxide	0.15
Vitamin assay core	.63
Vegetable fiber non-degradable (very fine grind)	0.4

The above ingredients are blended in a ribbon mixer as in Example 1, screened and packaged in a water impervious envelope, each containing 48 grams net weight and 180 calories. Each serving unit (48 grams) supplies about 22 grams protein, about 20 grams carbohydrates and about 1 gram lipids.

The vitamin-mineral assay core used in each example has the following weight percent composition:

Vitamin A palmitate, 500,000 I.U. per gram	1.94
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Ascorbic acid	11.7
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Thiamine hydrochloride	0.288
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Riboflavin	0.316
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Niacin	3.74
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Ferrous fumarate	9.00
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Vitamin D, 500,000 I.U. per gram	0.150
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dl-alpha tocopheryl acetate, 500 I.U. per gram	10.8
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Pyridoxine hydro- chloride	0.453
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Folic acid	0.0781
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Cyanocobalamin 0.1% triturate	1.08
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Potassium iodide	0.0313
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Zinc oxide	3.08
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Copper sulfate, penta- hydrate	0.825
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Biotin	0.0531
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Magnesium oxide	54.5
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Calcium pantothenate	2.03
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The vitamin-mineral assay core provides in each
 5 of the foregoing specific examples the following
 percentage of U. S. recommended daily allowance
 (U.S.RDA):

Vitamin A	45
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Vitamin C	45
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10 Thiamine	45
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Riboflavin	45
------------	----

Niacin	45
--------	----

Calcium	45
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Iron	45
------	----

15 Vitamin D	45
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Vitamin E	45
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Vitamin B ₆	45
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Folic Acid	45
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Vitamin B ₁₂	45
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20 Phosphorus	45
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Iodine	45
--------	----

Magnesium	45
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Zinc	45
------	----

Copper	45
--------	----

25 Biotin	45
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Pantothenic Acid	45
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Each serving unit of the dry composition supplies
 the following amino acids:

30 *Isoleucine	1300 mgs
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*Leucine	2060 mgs
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*Lysine	1630 mgs
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	*Methionine	520 mg
	Cystine	180 mg
	*Phenylalanine	1020 mg
	*Threonine	970 mg
5	*Tryptophane	300 mg
	*Valine	1440 mg
	Alanine	660 mg
	Arginine	700 mg
	Aspartic Acid	1400 mg
10	Glutamic Acid	4080 mg
	Glycine	380 mg
	Histidine	550 mg
	Proline	2130 mg
	Serine	1130 mg
15	Tyrosine	1070 mg

*Essential Amino Acids

When preparing the dry food compositions of the present invention for use 8 ounces of cold water are poured into a shaker or a blender provided with 20 a suitable lid and the contents of one unit serving package is emptied into the container of water.

The dry food composition and water are shaken for approximately 25 seconds or mixed in a blender for about 5 seconds. If desiring a thinner consistency or if the aqueous dispersion is not to be consumed immediately after preparing, slightly more 25 water can be used.

The resulting aqueous dispersion is a smooth pleasingly palatable drink which can be used as a 30 total replacement for at least one meal each day and provide a sensible eating formula for those de-



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siring to limit their caloric intake. The dry food composition in the present invention provides a complete well balanced diet including a relatively large amount of protein and essential vitamins and trace mineral, fat, carbohydrates and roughage in the form of non-degradable vegetable fiber. And, because of the pleasingly palatable taste of the water dispersed composition individuals wishing to reduce body weight or maintain body weight in a convenient and safe manner are more likely to continue use of the sensible eating formula of the present invention.

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CLAIMS

1. A dry nutritional food composition adapted for rapid dispersion in water consisting essentially of:

5 a) protein material derived entirely from animal sources consisting of casein, lactic casein, calcium caseinate, sodium caseinate and non-fat milk solids providing a total protein content of between about 25 and 50 percent by weight,

10 b) carbohydrate selected from the group consisting of fructose, dextrose and corn syrup solids providing a total carbohydrate concentration of between about 20 and 50 percent by weight,

15 c) lipids in the form of partially hydrogenated vegetable oil along with a minor proportion of lecithin providing a total lipid content of between about .5 and 10 percent by weight,

20 d) between about 0.4 and 5.0 percent by weight non-degradable vegetable fiber consisting of cellulose gum and cellulose gel in the form of finely divided micro-crystalline cellulose,

25 e) flavoring agents in an amount of about one percent by weight along with vitamins and minerals, and

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said nutritional food composition when mixed only with water being readily dispersible and forming a highly palatable liquid composition which contains sufficient bulk to avoid discomfort 5 between meals when used as a complete meal replacement.

2. A dry nutritious food composition as in Claim 1, wherein said protein comprises about 35% by wt. of said dry composition.

10 3. A dry nutritious food composition as in Claim 1, wherein said microcrystalline cellulose comprises from about 0.4% to 1.0 percent by weight.

15 4. A dry nutritious food composition as in Claim 1, wherein a serving unit of about 62 grams of said composition provides about 50 percent of the recommended daily requirement of protein, about 45% of the minimum recommended daily requirement of essential vitamins, about 250 calories, and has a combined content of protein, carbohydrate, fat and 20 vegetable fiber which satisfies the hunger of an individual when used as a total meal replacement.

25 5. A dry nutritious food composition as in Claim 1, wherein increased amounts of flavoring agents are incorporated in said composition as the content of said microcrystalline cellulose is increased up to about 1% by wt.; whereby the composition can be provided with an improved pleasingly palatable taste.

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INTERNATIONAL SEARCH REPORT

International Application No. PCT/US80/00366

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ^a

According to International Patent Classification (IPC) or to both National Classification and IPC

INT. CL. ³ A23L 1/30
U.S. CL. 426/74

II. FIELDS SEARCHED

Minimum Documentation Searched ⁴

Classification System	Classification Symbols
US	426/74 426/585, 588, 656, 658

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched ⁵

III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴

Category ⁶	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X	US,A, 3,097,947, PUBLISHED 16 JULY 1963, KEMERER.	1-5
X	US,A, 3,988,511, PUBLISHED 26 OCTOBER 1976, SCHAPIRO	1-5
X	US,A, 3,310,406 PUBLISHED 21 MARCH 1967, WEBSTER.	1-5
A	US,A, 3,432,306 PUBLISHED 11 MARCH 1969, EDWARDS.	1-5
A	US,A, 2,860,051 PUBLISHED 11 NOV. 1958, KREHL ET AL.	1-5
A	US,A, 3,126,283 PUBLISHED 24 MARCH 1964, NOZNICK ET AL.	1-5
A	US,A, 3,968,268 PUBLISHED 6 JULY 1976, SAIR ET AL.	1-5
X	DE,A, 2,730,158 PUBLISHED 25 JAN. 1979, GENERAL FOOD LTD.	1-5
A	N, SOYBEANS: CHEMISTRY AND TECHNOLOGY, VOLUME 1, PROTEINS, REVISED SECOND PRIN- TING, SMITH ET AL, ISSUED 1978, "TYPES AND COMPOSITION OF SOY FLOUR", SEE PAGES 310 AND 311.	1-5

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"X" document of particular relevance.

IV. CERTIFICATION

Date of the Actual Completion of the International Search: ¹⁹

14 JULY 1980

Date of Mailing of this International Search Report: ²⁰

24 JUL 1980

International Searching Authority ²¹

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